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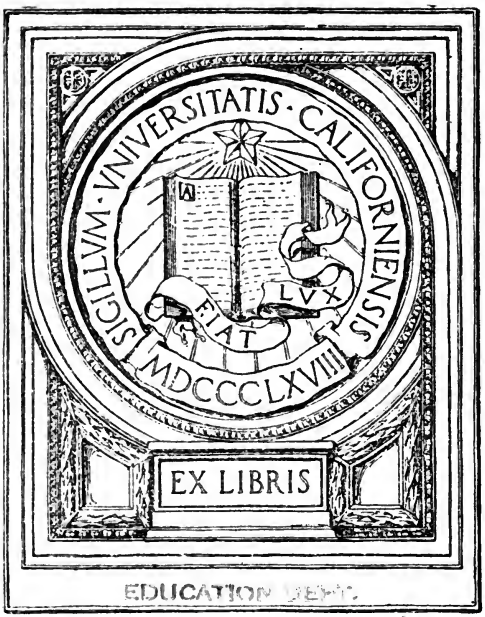

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IV*A*. THE SEPARATE TECHNICAL HIGH SCHOOL

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With the growth of industries and commerce there has come a demand for training along specialized lines not originally included in our scheme of public high schools. It has been in response to these needs that the remarkable development taking place in secondary education has had its chief inspiration. This has been particularly the case in the larger cities where changing conditions have been greatest and where the lack of persons especially trained to meet the needs of manufacturing and distributing has been most keenly felt. Demand for special training has, furthermore, come from within the ranks of the workers as well as from those directing these activities. A few years ago public secondary education had not been thought of, and the few private academies were concerned only with preparing their pupils for the colleges. This has been, in a measure, the heritage of our secondary schools, and it is only recently that the proposal to train boys in the high school for occupations, as well as for the professions, has met with approval. It is doubtful whether this would have been possible had not the way been prepared by the previous introduction of handwork or manual training. This study made its entrance only upon the earnest representation of its adherents that it was solely for cultural purposes and not with any utilitarian end in view. The usefulness as well as the educational value of handicraft soon became apparent, however, and we are now on the threshold of the greatest development along the lines of industrial and vocational education that has yet taken place.

Meaning of technical high school.—In New York, Chicago, San Francisco, Cleveland, and a few other large cities, there have recently been established special schools whose aims have so differentiated them from other schools as to require a new designation. The National Education Association, in order to get a clear view of what constituted schools of this nature, appointed a committee to consider and report upon a definition of a technical high school. It is this definition, subsequently

reported, that is taken as a basis in this paper. The definition is too comprehensive, however, to be included here.

At the outset it is necessary to exclude the so-called academic high schools, which merely have partial manual-training departments.

Nor would it seem proper to include under the head of the separate technical high schools those which boast of complete manual-training departments, but whose courses still are dminated by the universities and the colleges. Very few, even of the schools terming themselves technical high schools, have been able to divorce themselves from a curriculum which has for its fundamentals those studies usually prescribed in the literary schools and which devote less than 25 per cent of the time to handwork. A glance at the course of study of the manual-training high schools shows a course including English, mathematics, a language (either classical or modern), some history and science, plus shopwork and drawing unrelated to the rest of the course. In most of these schools even technical subjects have very little interdependence one with the other. Such schools should not be included under the head of separate technical high schools. Those of the above type being then eliminated, the schools that could be included would be only those which have a course of study where English, mathematics, science, shopwork, and drawing are the fundamentals and where the foreign languages and history play less important parts. Of schools of this nature there are comparatively few in the United States. Among the best examples are the related schools in San Francisco, namely, the California School of Mechanical Arts and the Wilmerding School of Industrial Arts for Boys. Another school of this nature is the Technical High School of Cleveland. Certain courses in the Technical High School in Chicago and the Stuyvesant High School in New York would entitle these institutions also to representation.

In some of these courses the aim seems to have been not so much to meet college requirements as to fit boys and girls to go out into industrial life. In this connection the Williamson Free School of Trades, in Pennsylvania, might also be included, as the academic work of the school is at least of high-school grade and the technical courses are scarcely to be approached by those of any of the public technical high schools.

Without attempting to analyze what is included under the various headings, one would find that a comparison of the courses of study is not without interest.

SAMPLE COURSES OF STUDY

THE CALIFORNIA SCHOOL OF MECHANICAL ARTS

Synopsis of Preliminary Courses

FIRST YEAR

BOYS AND GIRLS

	No. Weeks	Periods per Week
English	40	5
Mathematics (algebra)	40	5
Science (physics)	40	5
History (ancient and mediaeval)	40	5
BOYS		
General woodwork, molding, and pattern-making	40	10
Free-hand and mechanical drawing	40	5
GIRLS		
Sewing	40	7½
Free-hand and mechanical drawing	40	5

SECOND YEAR

BOYS AND GIRLS

English	40	5
Mathematics (geometry)	40	5
Science (chemistry)	40	5
History (modern European and American)	40	2½
BOYS		
Forgework and molding	40	10
Free-hand and mechanical drawing	40	7½
Modeling or wood-carving	..	..
GIRLS		
Dressmaking and millinery	40	10
Free-hand and mechanical drawing	40	5
Modeling or wood-carving	..	..

THIRD YEAR

BOYS

Mathematics (logarithms and trigonometry)	10	5
Science (radiant energy)	10	5
Machine shop	20 to 40	10

GIRLS

	No. Weeks	Periods per Week
Science (radiant energy)	10	5
German (elective)	40	5
Cookery	40	10
Household art and science, chemistry of cooking	40	5
Modeling or wood-carving	..	..

The preliminary course serves as a foundation for the different trades and technical courses. This part of the curriculum is essentially the same as the course given in the so-called manual-training high schools. It is different for boys and girls as regards toolwork and domestic branches, but otherwise it is the same for all students, and is required of all. It divides its time about equally between academic and industrial branches.

The academic branches include English, mathematics, science, and history. One period of fifty minutes per day for two years is devoted to each of these subjects with the exception of history, which is given on alternate days.

Instruction in English includes word-study, grammar, and rhetoric, practice in written and oral expression, and a study of literature through English classics, covering the ground designated as Subject One of the requirements for admission to the University of California.

The mathematical instruction includes elementary algebra, plane and parts of solid and spherical geometry, and plane trigonometry.

The science work consists of elementary physics during the first year, and chemistry during the second year. Various courses in applied science are given throughout the third and fourth years.

TRADES AND TECHNICAL COURSES

The school has facilities for teaching the following trades and technical courses, from which each student is allowed to make a selection at the beginning of his third year.

1. Pattern-making
2. Forgework
3. Molding
4. Machine-shop practice
5. Machine drawing
6. Industrial chemistry
7. Industrial art
8. Domestic science
9. Dressmaking
10. Millinery
11. Preparatory for technical college course
12. Polytechnic course

Through these courses the school aims to give each student a thorough knowledge of technique of some one industrial pursuit, from which he may earn his living. It offers, however, something more than the mere equivalent of a workshop apprenticeship. Besides the broad and thorough training

afforded by the combined academic and industrial branches of the preliminary course, there is the additional advantage that the shop instruction throughout is based upon work that is selected, as far as possible, for the benefit of the student, and not for the profit of his employer.

STUYVESANT HIGH SCHOOL, NEW YORK CITY

INDUSTRIAL COURSE

The industrial course of study has been prepared for boys who wish to go directly from high school to employment in some trade or other remunerative occupation.

FIRST YEAR

	Periods
English	5
Algebra	5
Free-hand drawing	2
Mechanical drawing	4
Joinery and cabinet-making	10
Music	1
Physical training, including physiology and hygiene	2
	29

SECOND YEAR

English	3
Plane geometry	4
Chemistry	5
Free-hand drawing	2
Mechanical drawing	4
Wood-turning, pattern-making, and foundry	10
Physical training	2
	30

THIRD YEAR

English	3
Plane geometry and trigonometry	3
Physics	5
Modern history	3
Mechanical and architectural drawing	4
Forging and machine-shop practice	10
Physical training	2
	30

FOURTH YEAR

	Periods
English	3
Shop mathematics	3
American history and civics	4
Advanced chemistry or economics or industrial and commercial law or applied mechanics	..
Steam and electricity	4
Mechanical or architectural drawing	4
Special shop or laboratory practice in one of the following electives:	10
1. Building construction (carpentry, sanitation, including heating and ventilating, electrical wiring and installation).	
2. Advanced forging and tool-making.	
3. Advanced pattern-making and foundry practice.	
4. Advanced machine-shop practice.	
5. Industrial chemistry, lectures and laboratory practice.	
Physical training	2
	30

The above course of study has been planned especially for boys who wish to go directly from high school to positions in machine shops or other works, in building construction, in electric-light and power plants, in chemical departments of manufacturing or packing establishments, in commercial industries requiring technical knowledge and skill, or in the various departments of the city government.

CHICAGO TECHNICAL HIGH SCHOOLS

SPECIAL INDUSTRIAL COURSES

The first two years in all the courses will be devoted to preliminary work in the fundamentals, as shown in the following outline.

FIRST YEAR

	Weeks	Periods
English	40	5
Algebra	40	5
Physiology	10	5
Physiography or bookkeeping	30	6
Mechanical drawing	40	5
Woodwork	40	9
Free-hand drawing	40	1
Gymnasium	40	1

SECOND YEAR

English	40	5
Plane geometry	40	5
Elementary physics or free-hand drawing	40	6

	Weeks	Periods
Mechanical drawing	40	5
Blacksmithing	20	10
Foundry and pattern-making	20	10
Gymnasium	40	1

At the beginning of the third year pupils will be given an opportunity to elect one of the following courses to be pursued during the third and fourth years:

COURSE IN MECHANICAL CONSTRUCTION AND ENGINEERING PRINCIPLES

THIRD YEAR

	Weeks	Periods
English	40	3
Solid geometry	20	5
Advanced algebra	20	5
Advanced physics	40	6
Industrial history	40	2
Machine-shop practice	40	15
Machine and free-hand drawing	40	5
Gymnasium	40	1

FOURTH YEAR

English	40	3
American history or civil government	40	2
Trigonometry	20	5
Chemistry	40	6
Manufacturing	20	15
Mechanical engineering principles	20	20
Machine and free-hand drawing	40	5
Gymnasium	40	1

COURSE IN ELECTRICAL CONSTRUCTION AND ENGINEERING PRINCIPLES

THIRD YEAR

English	40	3
Solid geometry	20	5
Advanced algebra	20	5
Advanced physics	40	6
Industrial history	40	2
Machine-shop practice	20	15
Electrical construction	20	15
Machine and free-hand drawing	40	5
Gymnasium	40	1

FOURTH YEAR

	Weeks	Periods
English	40	3
American history and civil government	40	2
Trigonometry	20	5
Chemistry	40	6
Electrical construction	20	15
Electrical engineering principles	20	20
Machine and free-hand drawing	40	5
Gymnasium	40	1

COURSE IN MACHINE-SHOP PRACTICE

THIRD YEAR

English	40	3
Shop mathematics	40	5
Advanced physics	40	6
Industrial history	40	2
Machine-shop practice	40	15
Machine and free-hand drawing	40	5
Gymnasium	40	1

FOURTH YEAR

English	40	3
American history or civil government	40	2
Chemistry	40	6
Machine shop	40	20
Machine and free-hand drawing	40	5
Gymnasium	40	1

In the above outlines one thing is apparent, namely, the tendency to drop part of the academic work and to devote more and more time to some special technical branch as the pupil progresses from the second toward the fourth year in school.

THE CLEVELAND TECHNICAL HIGH SCHOOL

In response to a specific statement from the secretary of this organization a longer description of the Cleveland Technical High School is given as a good example of the general type of separate technical high schools.

Aims.—The Cleveland Technical High School has two immediate ends in view: (1) to prepare youth of both sexes for a definite vocation

and for efficient industrial citizenship; (2) to help men and women already engaged in a vocation to better their condition by increasing their technical knowledge and skill. To such as may desire to pursue their studies still further it also offers the opportunity to prepare for entrance to technical schools of college rank.

In most classes the nature of the studies and the purposes in view are so different as to demand a separation of the boys from the girls. There is therefore organized within the one building a boys' school and a girls' school.

Sessions.—The daily session consists of nine periods of forty-five minutes each, beginning at 8:00 A.M. and ending at 3:15 P.M. The schedule of technical and laboratory work is arranged in double periods. Ordinarily each student is expected to carry three academic and two technical or laboratory subjects. There is a thirty-minute period for lunch not included in the above schedule.

The school is in session the year round. The year is divided into four quarters of twelve weeks each, with one week between the quarters. By thus eliminating the long summer vacation a saving of an entire year in the usual high-school course is made possible. This is of great advantage to the student (over 500 attending last summer) who for any reason may wish to secure a maximum of education in a minimum of time. Those who do not wish to avail themselves of this advantage or whose physical condition does not permit of the strain of continuous study, still have the opportunity of devoting four full years or longer to their high-school course.

The plan of a continuous session broken up into short terms is also of advantage to the student who from any cause fails in some part of his work, since by these frequent opportunities for readjustment he is given a chance to "catch step" again and to go on with his work in a new class with comparatively little loss of time.

DESCRIPTION OF COURSES

The courses not described are not distinctive.

English.—In the teaching of English literature, the constant aim is to make clear the relation of literature to life. A development of the power of appreciation is sought. A sense of form can be developed much better by the study of good models, where the pupils see how a master-writer puts his material together, than by the learning of rules.

Such of the college requirements as lend themselves to this treatment are retained. Only those substitutions are made which meet with the approval of the prominent scientific schools. The supplementary reading includes much that is best in invention and discovery, manufacture and distribution, and the attendant industrial and labor problems.

Wherever practicable, the composition work is co-ordinated with the other departments of the school, thus interrelating and binding together the course of study. By these means it is believed the pupil will attain that power, ease, and accuracy in the use of the English tongue which is admittedly of such great practical value as a preparation for life.

Mathematics.—The course in pure mathematics includes the usual theoretical work, the study of principles involved, and a thorough drill in mental arithmetic and the control of number.

On the technical side the pupil articulates the mathematics with the work of the drafting-room, shop, domestic science, and domestic art. Teachers of technical subjects are in constant touch with the mathematics department, anticipating problems which will arise and reporting immediately to that department any weakness shown by a pupil in problem or principle. In the Senior year advanced college mathematics is available, but for those not going to college a course in applied mathematics, composed of shop problems and elementary mechanics and electricity, is open.

Science, physiography.—The first and second terms are spent in studying physiography and meteorology. The processes of physiography and the land forms which they produce are taken up. A laboratory and field acquaintance with the common rocks is acquired during these terms.

Study of industries.—The third term is spent in studying the industries of various regions in their relations to climatic and physiographic conditions. The localization of industries and the cause of such localization can be worked out in a large measure. The location and growth of cities and the causes which govern their location and growth are pointed out. In general, the course aims to give the student an acquaintance with the physical environment in so far as it governs the physical conditions under which he lives.

Excursions to factories and other points of interest in Cleveland and vicinity are made whenever deemed profitable in connection with the study of industrial geography, industrial history, and allied subjects.

Chemistry for boys.—This chemistry is given in two separate and distinct courses.

The elementary chemistry is taken in the second year and is required of all boys. Consideration is taken of the more important elements with practical application, as far as possible. Four recitations and demonstrations, with one double laboratory period, constitute a week's work.

The advanced chemistry is taken in the fourth year and is an elective. This course is made intensely practical and includes much elementary metallurgy. The nature, uses, and methods of manufacture of charcoal, coke, iron, and steel are considered. Gas producers and types of industrial furnaces are treated. Modern practical figures and analyses are quoted and used in the discussions and problems.

Physics.—A special text has been written by the department in which much more attention is given to practical shop problems, mechanics, heat, and electricity, and less of the theory of physics and a minimum of physics of accurate measurement involved.

Electrical construction.—An electrical construction laboratory for trade classes has been equipped and sixty students are engaged in this line. A recitation devoted to theory is held daily and twenty periods per week are given to practical construction problems.

Most of the teachers of technical subjects are men with trade experience who have acquired later the art of teaching. The employment for twelve months in the year makes it possible to secure the best of teachers in competition with the manufacturers.

Drawing.—During the first two years, mechanical drawing, in so far as it applies to the shopwork only, is required. Drawings are made of shop problems and individuality of solution in place of class exercise is strictly followed out.

This subject is taught as the language through which the student learns to give graphic expression to ideas which he is later to work out in material forms in shop and workrooms. It is the one medium through which the craftsmen are able to record, clarify, and perfect such ideas as may come to them.

Training is given in accurate work by means of exercises and problems especially designed to enable the student to read intelligently the drawings which he is to use later in his shop practice. These exercises not only bring into use the various instruments in the student's equipment, but also represent some definite object to be made later in his course in joinery, wood-turning, forging, or pattern-making.

In addition to carefully constructed working drawings, free-hand sketches and views are made for the purpose of giving clear mental conceptions of the object and to teach the appearance and relation of the different views to each other, as well as to show the proper position of each on the drawing plate.

Shopwork.—Since the fundamental principles underlying all of the arts are identical, during the first two years a more or less definitely prescribed outline of instruction must be laid down. The shopwork of these two years is therefore practically a general course in manual training. The use and care of the various tools and machines, the qualities of materials and the processes of their preparation and distribution, and facility in applying the fundamental principles of construction are the chief ends sought.

This work is intended to be educative and creative as well as technically constructive. From elements and principles taught in the mechanical drawing and shop classes each pupil makes his own designs, which, when approved by the instructors concerned, he executes from working drawings. Within due limitations as to practicability and suitability of form and material, free scope is given to his inventive talent in the making of his design; but this once decided upon, he is held to strict accuracy and workmanship in its execution.

The course prescribed for the first two years is: turning, first quarter (I D); cabinet making, second and third quarters (II and III D); pattern-making and foundry practice, first quarter of second year (I C); forging, second and third quarters, second year (II and III C).

One quarter is also required in machine-shop practice at the beginning of the third year (I B). If at the end of this time peculiar adaptability in any given direction becomes evident to pupil, parent, or teacher, specialization along this line will be permitted in order that upon graduation a pupil may be better fitted for his life-work. The choice of vocation is forced upon a majority of our youth at an early age, and if a proper choice can then be made it is a great advantage.

Twenty-four periods per week are available for trade instruction in the third and fourth years.

DISTINCTIVE COURSES FOR GIRLS

The course in sex physiology.—Inasmuch as the study of the processes of life and training in observation can best be begun with a consideration of lower forms, the girls are segregated and stress is laid upon hygiene

and physiology for women. Special attention is paid to laboratory work and demonstration.

Chemistry for girls.—This course is directly correlated with domestic science and its aim is to give such experiments as will be of practical value to the girls after finishing school.

The applied work comprises the study of combustion, carbohydrates, fats, and proteins in many different phases, the manufacture of foods, the detection of the food principles in foods, such as starch in cereals, sugar in milk, etc.; the detection of adulterants, and some simple analyses, such as milk, eggs, etc.

Domestic art.—The aim here is to give such training as will enable girls as they grow to womanhood to appreciate the practical, economic, and artistic value of various materials in their application to dress and home furnishings.

The course includes plain sewing, the making of outfits for use in the departments of domestic science and domestic art, undergarments, shirtwaist suits, simple summer dresses, and millinery. Principles of handwork in the way of rolled edges, setting-in of lace, hand-run tucks, and elementary embroidery are introduced and applied to underwear. Original designs made by the pupils are used for this work and in the decoration of the table linen for the dining-room of the domestic-science department.

Millinery.—A course in spring and fall millinery is provided for girls who have learned some of the fundamental principles of sewing. Millinery affords the girls a broad expression of individuality and aims to create an appreciation of artistic color combinations and appropriateness.

The subject is closely connected with the courses in dress-making and applied art and consists in talks on materials used in millinery, wiring hats, making buckram and straw hats, wire frames, facings, building bows and covering frames, renovation of old material, and trimming hats. Attention is given to economy, simplicity, suitability, and the cultivation of artistic taste in all lines of work.

Domestic science.—The purpose of the work in this department is threefold: (1) to teach all subjects pertaining to the care and duties of a home, that girls may be prepared for practical home-keeping; (2) to teach all the theory relating to the above subject as applied science, that girls may acquire intellectual development as well as practical skill; (3) to teach institutional cookery and kitchen management as trade subjects, that students may be prepared for catering as a vocation.

Applied arts.—As mechanical drawing is made the medium of expression in the shop, so is free-hand drawing in this department. Nature forms are studied and sketched in the flat, in detail, and in color. From these studies pupils derive conventionalized units which by repetition and grouping furnish motives for original ornamental designs and for suggestions of form, proportions, and color harmonies. These they apply directly in constructive work, as in borders for garments, draperies, naperies, and in embroideries, in the decoration of pottery and leather-work; and in the designing, decorating, and making of utensils and articles of household and personal use from various materials and fabrics. The work, therefore, correlates in very definite and practical ways with dressmaking, millinery, domestic science, and the mechanic arts and crafts, and with the many occasions in daily life which an intelligent appreciation of fitness and beauty adds greatly to vocational success or personal happiness.

Costume design.—For girls taking sewing in the first and second years the design and free-hand drawing is all applied work. Underwear, shirtwaists, skirts, dresses, and hats are designed and the article actually worked out from the design.

Correlation.—Domestic-science subjects are often given as themes in the English classes. See also the courses of domestic and applied arts for ways in which these are correlated with domestic science. In short, all technical subjects involving home-making are taken as the basis of the elementary courses for girls, and around these the rest of the studies are grouped.

EVENING SESSIONS

One of the most important missions which this school can fulfil is the betterment of people already engaged in a given vocation. The abolition of the apprenticeship system in the subdivision of manufacturing processes has made it practically impossible for mechanics to secure any general training which will increase their efficiency and consequently their earning power in their present position or enable them to fit themselves for a better position. There is a need among the semi-skillled working classes of an opportunity for industrial education, and to meet this need the Cleveland Technical High School offers trade courses during the evening to men and women already employed during the day.

The evening sessions are from 7:15 to 9:15 P.M. The classes are divided into two sections, one meeting Monday and Thursday evenings and the other meeting Tuesday and Friday evenings.

The entire equipment used for instruction in the day school is available for the evening classes. Instruction is offered to men in carpentry, cabinet making, pattern-making, foundry practice, tool-forging, sheet-metal work, machine-shop practice, and electrical construction. Allied with these subjects is instruction offered in trade mathematics, English, applied mechanical drawing, including architectural sheet metal and machine drawing. Complete courses in plain and hand sewing, machine sewing, spring and fall millinery, and the applied arts are available to women. Plain cooking and whatever allied courses may be called for by a sufficient number are also within the scope of the night school. Free-hand drawing, charcoal and water-color rendering, clay-modeling, book-binding, leather-work, art metal-work and design as applied to the crafts are also offered.

The present enrollment is 1,517 day-school students. There are also 450 night-school students with over ninety on the waiting list for the machinery trade classes.

INTERPRETATION OF THE TECHNICAL HIGH SCHOOL

In the public technical high schools we seem mainly to have undertaken instruction in the machinery trades, namely, pattern-making and foundry practice, forging, machine-shop practice, mechanical and architectural drawing, and industrial art. The building trades seem to have been neglected. On the other hand, in the Williamson and Wilmerding schools, great prominence has been given to these most worthy lines of instruction.

Further inspection of courses shows that an effort is being made to condense into the first two years the handwork formerly given in the manual-training high schools in four, and to devote the last two years to specialization in some one technical line. The average age of pupils entering high school is fourteen and one-half years. They are then too young to select, or are unprepared through lack of grammar-school training, to receive trade instruction. From this point of view, the two years given to manual training, which seeks to place in the student's hands as much of general industrial aptitude as possible, is well spent and makes a rational choice of trade work at a later date far more probable. It further leaves open to the student the possibility of preparing for a technical college. One of the complaints made against the technical high school has been that it is failing in its purpose of supplying the industrial unit for work at the trade and is inspiring boys to seek an

engineering education. Doubtless this provision in the course of study is wise to just that extent. The technical high school cannot and never should hope to supply the trade with its workmen, but should fit boys to enter industrial callings and at the same time should include technical college preparation.

Separate technical grammar grades.—The limited available statistics show that the graduates of technical high schools very generally follow out their lines of training and to advantage. However, there is great need in a manufacturing country for the proper training of those who are to work at the trades, particularly where the highest skill is required as in the machinery trades. This is not the function of the technical high school. In the city of Cleveland—and this is true of nearly every large manufacturing center—fifty-two out of every one hundred girls and boys who enter the first grade of the public schools never get above the fifth grade. A differentiation in the courses of study in the grammar grades is as inevitable as the differentiation that has taken place creating the separate technical high school, and is more to be desired. Most of our population is predestined by birth and environment to enter the ranks of the workers and is entitled to recognition in the preparation open to it for that work. So the separate technical grammar grades are as essential as the separate technical high schools. These grammar grades, so set aside, should have the two-fold function of preparing the boys and girls for workmanship or for further technical education. In the same way the technical high school should fit for foremanship or for the technical college. It is not so much a question of the best education as it is of some education or none. To illustrate this point by a parallel, in Cleveland there were in 1905 six public district high schools with a total attendance of about 4,800. Cleveland was growing at the rate of 18,000 per year, yet there was a growth in the high schools in 1906–7–8 of only six, though the city increased by 54,000 in population. Since then, that is, in a period of equal length, 1909–10–11, the high-school attendance of this city has increased to 7,300, or 52 per cent. This, then, is simply a case of no education in 1906–7–8 for 2,500 children balanced against vocational education for 2,100 in 1911, plus a stimulation in the attendance of over 300 pupils in the academic high schools. It is not then a question of the desirability of the separate technical high school but a question of getting the boy to attend school or allowing him to go uneducated.

If these results can be accomplished for the comparatively small number who finish the eighth grade, the results to be obtained on a basis of the same percentage by the separate technical grammar grade would affect far greater numbers. With the technical grammar grade the opportunities for highly specialized trade work in the separate technical high school will be increasingly greater and the desirability of all forms of education more and more apparent to the public. To a large percentage of the working people, education, as now conducted, seems useless beyond the fifth grade, or it is to be obtained at too great a sacrifice. A change, then, in our whole system is inevitable if we are to check our "growing illiteracy." (This is a quotation from one of the officers of the National Census Bureau.) The separate technical high school is not now able to render its maximum of usefulness to the community for the reason that the pupils entering its courses are not especially adapted to its work through the proper elementary preparation and come to the school largely by chance. Trade instruction also has to be delayed on this account.

In the organization of the separate grammar grade, however, a choice of types of education beyond that point (i.e. in the high school) must not be made impossible. That is, a change of plan must still be available and a boy from the technical grammar grade should not be hampered in his choice of a high school any more than at present. His training should be such that he could enter either an academic, a technical, or a commercial high school with little loss due to preparation.

Looking again at the curriculum of the technical high schools we see that they embrace English and mathematics in common with the academic schools. Science seems also to be a requirement of the former, though frequently an elective in the latter. The substitution of handwork for a language other than English and a curtailment of the time given to purely academic subjects in the third and fourth year, together with an increase of time devoted to specialization in technical or shop branches, seem to be the main points of difference.

To many pupils, in fact to probably 75 per cent of those who enter the technical high schools, the opportunity to get further education is not possible, due largely to the lack of financial means. These schools must then be the finishing school for most of the boys and girls and to this end the trade instruction is useful. In the New York and Baltimore schools the opportunity to do engineering work of an elementary nature

is a particularly attractive feature. In the Stuyvesant School the equipment, by its very elaborateness, readily lends itself to this end. In fact, there are some colleges which cannot boast of so fine an equipment in their mechanical laboratories as is here available. This is true with regard to both mechanical appliances and electrical machinery. At the Crane School in Chicago the Electrical Construction Laboratory is equally elaborate, though it is reported that the equipment is of greater service to night- than to day-school pupils. In the Cleveland School the effort seems to have been in the direction of trades rather than in that of engineering lines. The field so uniquely held by the Stuyvesant School is certainly one in which other high schools could be of great service. Students wishing to enter the engineering field but to whom the colleges are not a possibility might prolong their courses two years and make the separate technical high school truly "the poor man's college." This opportunity should be made a possibility by extension of the function of our high school.

Training for technical teachers needed.—It rarely happens that manufacturers can find foremen or shop superintendents who have suitable training for their positions, and in many instances our best men are foreign-trained. There are two reasons back of this: one is the inability of the manufacturers to offer the proper training to their men, and the other is the lack of proper schools. We cannot, therefore, draw our teachers from the shops and factories except in rare instances. One of the functions of the technical schools should be to train the men, who, with adequate additional shop experience, can in turn take the positions in the technical high schools, or who will be fitted to organize the work of the grammar grades. Technical schools are now suffering as much from a lack of trained men for the teaching staff as from all other causes. Chicago seems to be the only city that has made an effort in a public way looking toward supplying the necessary teachers. In the normal courses of that city, work as now planned will fit teachers for these branches of the profession. But in a country where manual-training schools are growing up everywhere and where technical schools are filled to their capacity before the buildings are even completed, the meager supply is inadequate, to say the least. We must have normal technical training.

Summary.—In recapitulation, then, these points should be noted. (*a*) Proper training must be available in grammar grades: first, for the

trades; second, for the academic school; and third, for the separate technical high school.

(*b*) Proper training must be available in the separate technical high school for: first, the trade foremanship; second, for high-school engineering courses and technical normal courses; and third, for technical colleges.

These are to be some of the developments in the larger cities in public secondary education in the immediate future.

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